# PREDICTION OF HAZARD FOR FIBROUS MATERIALS

Vernon Timbrell

MRC Pneumoconiosis Unit
Llandough Hospital
Penarth, South Glamorgan, CF6 1XW

Prediction of whether exposure to a new fibrous material could give rise to pulmonary disease involves estimation of the fibres which would be retained in the lungs. Basic data showing how retention depends on fibre diameter and length has been obtained by comparing the size of fibres in dust samples taken at the Paakkila anthophyllite mine with the size of fibres recovered from postmortem lungs. This asbestos mine, now closed, was unique in that it met the requirements for this work, in particular, wide ranges of fibre diameter and length encompassing the respirable size limits and fibre durability in lung fluids.

Fibres were measured using transmission electron microscopy and a method combining magnetic alignment and light scattering.

Representative results are presented graphically in Figures 1, 2 and 3. Figure 1 shows the size distribution of the airborne dust. Figure 2 the size distribution of lung dust and Figure 3 the relative retention derived from the two distributions.

When a material has the same density as anthophyllite, the expected size distribution of the lung dust may be derived from Figure 3 and the measured size distribution of the material. If, for instance, the material of interest is Paakkila anthophyllite one uses Figure 3 and Figure 1 and obtains Figure 2. For application to other materials, Figure 3 is modified to allow for the influence of density on fibre deposition.

The method has been applied to South African amosite fibres in Transvaal mines. Good agreement was obtained between expected and observed size distributions of lung dust.

To estimate the potential health risks of a material the expected size distribution of the lung dust becomes the first term in a multiplicative formula. Two terms allow for its durability in lung fluids and expected concentration. A fourth term quantifying its pathogenicity is derived from data available in the numerous 'in vivo', in vitro and epidemiological studies made on fibres differing in sizae and chemical composition. The product of the terms indicates the magnitude of the hazard.

1002648893



Source: https://www.industrydocuments.ucsf.edu/docs/jhkk0000

1002648894




Figure 1.

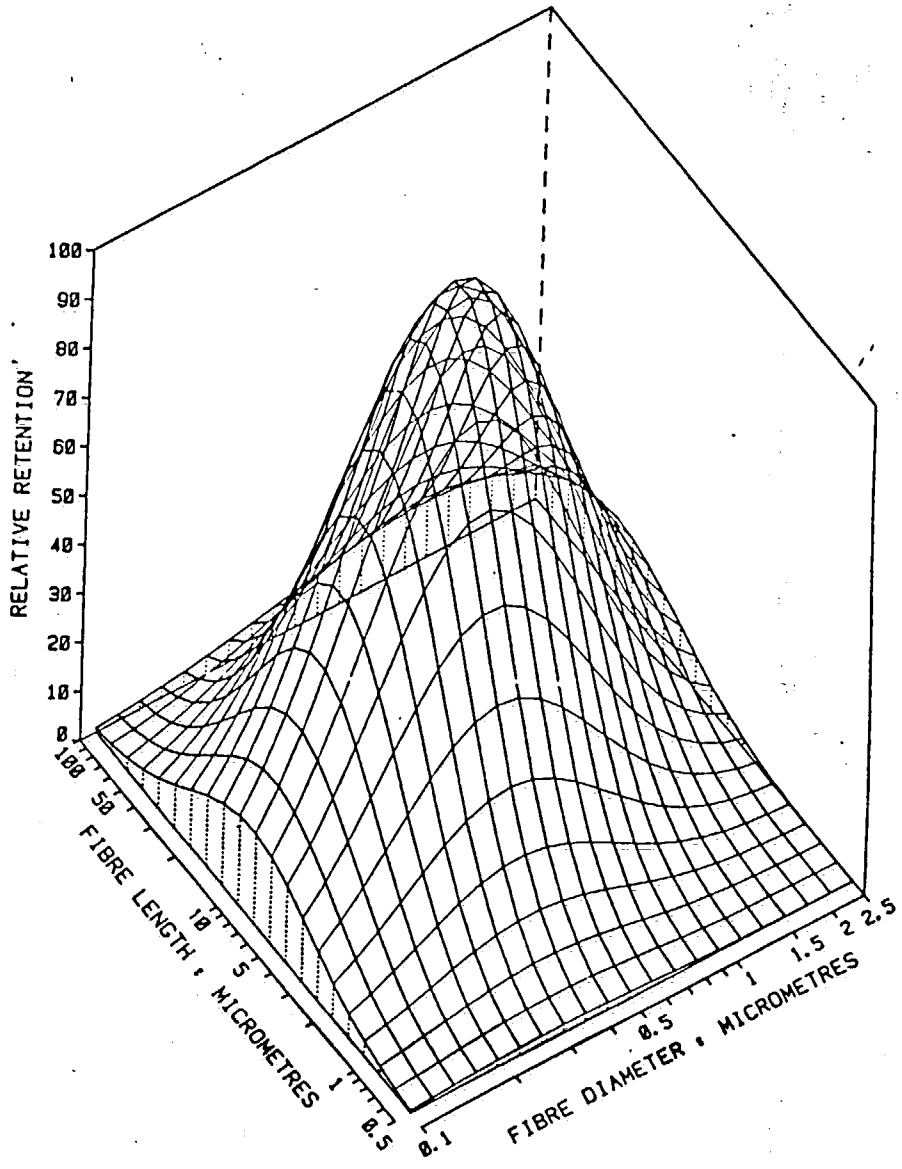



Figure 2



Source: https://www.industrydocuments.ucsf.edu/docs/jhkk0000

Figure 3






1002648895

Source: https://www.industrydocuments.ucsf.edu/docs/jhkk0000